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Abstract

THE DEVELOPMENT OF THE NEW SEPARATION PLANT, WINDSCALE

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The New Separation Plant, Windscale, is a centralised, high throughput reprocessing plant, designed to extract economically plutonium from natural uranium or low enrichment fuels arising from power reactors. This paper describes the evolution of the process and the techniques used in establishing its performance.

The specification of the process and products are given and against these the paper discusses the relative merits of various processes.

Reasons are given for the decision to install a mechanical decanning unit and a 3-cycle, 20% tri-n-butyl phosphate in odourless kerosene extraction system, in which uranium and plutonium are separated in the second cycle. Factors affecting the choice of ion-exchange or solvent extraction processes for the plutonium purification cycles are also described.

The influence of effluent disposal on process selection is emphasised, the implications of solvent degradation briefly discussed and the principal problems and methods of control of nuclear safety in the plant are summarised.

The techniques used in establishing the selected process and equipment in an economical manner are described in the sequence of computation of the flowsheet, selected laboratory studies, pilot plant trials and equipment tests.

Specific chemical problems which are discussed include uranium-plutonium separation, solvent washing and solvent degradation. The procedures used for the development and testing of solvent extraction flowsheets on a

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miniature pilot plant, which closely replicates process conditions on the large-scale plant, are described. The paper outlines the basic principles of the mechanical decanning unit developed and gives the methods used in design and development of the mixer-settler units selected for the process.

It is concluded that the process and plant is capable of flexible and economic operation with considerable potential increase in throughput both for natural uranium and low enriched (e.g. A.G.R.) type fuels.